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ABSTRACT

A national sample of 337 college students who initially aspired to be physicians were studied for 9 years to determine the influence of precollege characteristics, college origins, and the academic and social experience of college on the likelihood of becoming a physician. Estimates of a 14-variable causal model indicated that the major direct effects on attainment were attributable to college characteristics and the academic experience of college. The selectivity/prestige of the undergraduate institution attended, collegiate academic achievement, and majoring in the physical or life sciences each had significant direct effects on becoming a physician. The direct positive influence of college quality, however, was counterbalanced by its negative indirect effect. The greatest advantage in attending an elite institution accrued to those students with relatively high levels of academic performance. As academic performance declined, so did the positive effect of college quality. The effects of precollege characteristics on becoming a physician were largely indirect, mediated by the student's college experience. While women were no less likely than men to become physicians, being female had a significant negative indirect effect. (SW)

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The Effects of the Undergraduate Experience
on Entering a Prototype Profession

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Abstract

This study employed a national sample of college students who initially aspired to be physicians to determine the influence of pre-college characteristics, college origins, and the academic and social experience of college on the likelihood of actually becoming a physician. Estimates of a 14 variable causal model indicated that the major direct effects on attainment were attributable to college characteristics and the academic experience of college. Net of other causes, the selectivity/prestige of the undergraduate institution attended, collegiate academic achievement, and majoring in the physical or life sciences each had significant direct effects on becoming a physician. The direct positive influence of college quality, however, was counterbalanced by its negative indirect effect. Moreover, the greatest advantage in attending an elite institution accrued to those students with relatively high levels of academic performance. As academic performance declined, so did the positive effect of college quality. The effects of pre-college characteristics on becoming a physician were largely indirect, mediated by the student's college experience. Net of other factors, women were no less likely than men to become physicians, but being female had a significant negative indirect effect. Conversely, secondary school achievement did not directly influence attainment but did have a large positive indirect influence.

Occupational attainment has frequently been studied as a salient achievement outcome of postsecondary education (e.g. Alwin, 1974; Sewell and Hauser, 1975; Smart, in press; Spaeth and Greeley, 1970; Tinto, 1980, 1984; Trusheim and Crouse, 1981). The results of this body of research suggest that those with a college degree have a distinct advantage, relative to those who end their education with secondary school, in terms of subsequent occupational attainment (e.g. Blau and Duncan, 1967; Jencks, et al., 1972; Jencks, et al., 1979; Sewell and Hauser, 1975; Sewell, Hauser and Featherman, 1976). The kinds of institutions attended by college students and their academic performance within those institutions, however, may have little impact on subsequent general occupational attainment when variation due to student social origin, academic ability, and aspiration is taken into account (e.g. Alwin, 1974; Jencks, 1972; Sewell & Hauser, 1975; Treiman & Terrel, 1975; Trusheim & Crouse, 1981).

As suggested by Smart (in press), there may be at least two reasons for the apparent minimal association between undergraduate institutional characteristics and measures of subsequent career attainment. One of these is conceptual in nature, while the other is basically methodological. The conceptual problem, as developed by Tinto (1980), suggests that status attainment research has treated all occupations in an undifferentiated manner, based on the unwarranted assumption that there is but a single labor market. Recent theoretical and empirical work by Montagna (1977) and Tinto (1980, 1981), however, suggests that there may be a segmented labor

market in which the salient factors influencing occupational status attainment vary for different occupations or careers. Supporting this notion of a segmented labor market in the professions is evidence indicating substantial variation in the career attainment processes for lawyers (Smigel, 1964), scientists (Zuckerman, 1977), engineers (Perucci & Perucci, 1970), and university professors (Crane, 1969; Hargens, 1969).

Recent evidence by Tinto (1980, 1981) suggests that there may be reasons to suspect non-trivial differences in both the degree and manner in which college characteristics and college experiences influence the process of career attainment in various occupations. Professional occupations, he notes, are characterized by the centrality of intellectual skills and knowledge requirements which are typically acquired in formal educational settings, such as college. On the other hand, nonprofessional (e.g. business-managerial) careers are more likely to require the development of interests and skills which are learned in work settings. Consequently, Tinto further proposed that college origins and educational attainments have a more important influence on career attainment in the professions than in non-professional careers. The findings from a national sample of white male college graduates, broadly dichotomized into professional and business-managerial careers, tends to support this premise, although Tinto's (1980) regression model lacks a measure of pre-college academic ability or

achievement. More recent findings by Smart (in press) using a similar approach are somewhat less supportive. Taken together, however, the results of this status attainment work by Tinto and Smart suggest that undergraduate college origins and individual experiences may play a central role in career attainment when specific professions are considered.

The second, methodological, problem concerns the rather limited way in which variations in the collegiate experience have been measured in status attainment research. The two most commonly used measures of the collegiate experience in status attainment investigations have been the selectivity/prestige of the undergraduate institution attended and the student's undergraduate grade-point-average (Cohen, 1984; Smart, (in press); Solomon, 1975). As argued by Kerckhoff, Campbell & Trott (1982), and Smart & Pascarella (in press) the use of one or two measures cannot begin to capture the full complexity of the college experience. Consequently, the status attainment research may be underestimating the true effect of between and within college differences on career attainment relative to the effects of student social origin and precollege variables.

Related to this general failure to adequately portray the complexity of the collegiate experience is the tendency, with a few notable exceptions (e.g. Alwin, 1974; Tinto, 1980), to focus on the direct effects of the college experience on occupational attainment. Such an approach tends to ignore, or dismiss as

secondary, potentially important indirect influences on status attainment through intervening variables. As a result, the total effect of educational experiences may be underestimated.

The purpose of the present study was to address these problems in existing research by assessing the direct and indirect impact of the undergraduate college experience on occupational attainment in one "prototype" profession, medicine (Goode, 1969). Specifically the study focused on students from a national sample, who at entrance to college aspired to become physicians (with an M.D. degree). The sample was followed over a nine-year period in an effort to determine the direct and indirect effects of social origins, secondary school experiences, undergraduate college characteristics, and specific academic and social aspects of the collegiate experience on becoming a physician.

Causal Model

The factors influencing one's becoming a physician (or attaining an M.D. degree) were conceptualized as part of a general causal model. The development of this model was guided both by the seminal status attainment models (e.g. Blau and Duncan, 1967; Sewell and Hauser, 1975) and by models of college impact on student development (e.g. Chickering, 1969; Lacy, 1978). The status attainment literature tends to regard occupational attainment as the result of the complex interaction of the individual's background traits (e.g. social origins) and their subsequent experiences and

achievements (e.g. secondary school, college). The models of college impact have adopted much of the thinking typically associated with status attainment. One particularly useful model developed by Lacy (1978) suggests that college impact is a function of three major sources of influence: (1) student background or precollege characteristics (e.g. social origins, aspirations, secondary school attainments); (2) the structural or organizational characteristics of the college attended (e.g. selectivity, size, configuration of student majors); and (3) interactions between students and the primary agents of socialization on campus (i.e., faculty and students).

Tinto (1975) has suggested what may be a fourth source of influence, academic integration. By academic integration he means the extent to which students have successful interactions with the institution's academic system (e.g., satisfactory academic performance, selection to academic honor societies). Although other models proposed for the study of college impact (e.g. Astin, 1984; Pascarella, 1980; Weidman, 1984) differ somewhat in their focus, all would appear to acknowledge as a minimal core the four basic components discussed above: (1) student precollege characteristics; (2) institutional characteristics; (3) interactions with faculty and peers; and (4) level of academic integration.

The causal model estimated in this study incorporates the principal constructs of both the status attainment and college impact models. The model is longitudinal and posits that the kind

of undergraduate institution attended (e.g., selectivity/prestige, size, percent student majors in science) is a function of student precollege characteristics (e.g., ethnicity, sex, family socioeconomic status, secondary school experiences, occupational aspirations¹). In turn, it is expected that student precollege characteristics and the kinds of undergraduate institutions attended will influence the nature of the student's collegiate experience (e.g., major field of study, academic integration, social leadership experiences and interaction with faculty). Within this block of variables, major field of study was causally prior to the other three variables. Finally, becoming a physician was hypothesized as dependent upon all preceding variables in the model. Consistent with the suggestions of Tinto (1980) and Smart (in press), however, it was expected that the strongest direct effects on becoming a physician would come from between-college characteristics and within-college measures of the individual student's collegiate experience. The influence of precollege characteristics was expected to be largely indirect, mediated through the influence of these variables on the kind of undergraduate college which the student attends and his or her individual academic and social experiences at that institution.

Because this study assesses the various background and schooling influences on becoming a physician within a longitudinal causal model, it represents a major departure from existing research. Studies of the factors affecting physician career choice

and attainment in medicine have been numerous (e.g., Rezler, 1969; Rezler, 1985; Zuckerman, 1978). This body of research, however, has largely ignored the complex process by which the individual's background characteristics, secondary school attainments, college origins, and specific academic and social experiences interact to influence his or her likelihood of becoming a physician.

METHOD

Sample

Data for this study were drawn from respondents to the 1971 and 1980 Cooperative Institutional Research Program (CIRP) surveys. The overall sample consisted of 10,326 students attending 487 colleges and universities varying in type and control. All respondents completed the initial CIRP survey upon entering college in the fall of 1971. This survey instrument obtained a broad array of information on students' family backgrounds, secondary school experiences, initial occupational aspirations, and personal characteristics. In 1980, approximately nine years later, the same respondents completed a follow-up instrument that collected information on their actual collegiate experiences as well as their educational and occupational achievements. The sampling scheme and design for the 1971 and 1980 CIRP surveys are discussed in detail by Astin (1982).

The sample was defined initially by selecting only those individuals who initially enrolled in 1971 as full-time freshman students in a four-year college or university; and who attended only one institution during their undergraduate careers. The restriction on attending a single undergraduate institution was necessary in order to eliminate ambiguity in relationships between institutional characteristics and measures of the collegiate experience. The 1980 CIRP survey referred only to the last undergraduate institution attended while institutional characteristics referred only to the first institution attended. The sample was further limited by selecting only those individuals meeting the above criteria who on enrolling in college in 1971 aspired to be physicians as their top occupational choice. This yielded a final sample of 337 on whom the analyses were conducted².

Variables

The model estimated in the study included four different variable sets ordered in a causal sequence:

1. Student precollege variables: gender, ethnicity, father a physician, mother a physician, secondary school academic achievement, secondary school social accomplishment, and family socioeconomic status;
2. Undergraduate institutional characteristics: institutional selectivity/prestige, institutional size, and percent

students in the institution majoring in physical or life sciences;

3. College experience variables: physical/life sciences major, collegiate academic achievement, interaction with faculty/staff, social leadership experiences (within this variable set physical/life sciences major was considered causally antecedent to the other three variables);
4. Dependent variable: whether or not the individual was a physician (obtained the M.D. degree) in 1980.

The precollege student characteristics were obtained from the 1971 CIRP survey, the institutional characteristics were obtained from the Higher Education General Information Survey (Hegis) files available on the CIRP tape, and the remaining variables were comprised of items from the 1980 CIRP follow-up survey. Table 1 presents full operational definitions for all variables in the model and their reliability estimates where appropriate.

Insert Table 1 about here

Analyses

Student precollege characteristics were considered exogenous variables (determined from outside the causal system) while all other variables in the model were considered endogenous (determined from within the causal system). Estimation of the direct and indirect causal effects implied by the model was done in two parts. First, ordinary least squares regression was used to estimate the

coefficients of the eight structural equations defining the general model. In solving these structural equations each endogenous variable was regressed on all exogenous variables and all other causally antecedent endogenous variables in the model. This yielded eight sets of standardized regression coefficients representing the direct effects of causally antecedent variables on each of the endogenous measures. The size and sign of the standardized direct effect represents the amount of change in the dependent measure for every unit standard deviation change in the predictor variable, net of the effects of all other variables in the equation.

In the second step of the analyses the indirect effects of each variable in the model on becoming a physician were computed using GEMINI (Wolfle & Ethington, 1985), a FORTRAN program based on the work of Sobel (1982). Indirect effects are simply the sum of the products of direct effects through intervening variables in the model. The program developed by Wolfle and Ethington (1985) also computes the statistical significance of each effect.^{3,4}

RESULTS

Prior to the main analysis, a set of preliminary analyses was conducted to determine if there were significant gender or ethnicity differences in factors influencing one's likelihood of becoming a physician. In the first preliminary analysis becoming a physician was regressed on all 14 independent variables in the model plus a set of terms which represented the cross-products of gender and each independent variable. A significant cross-product term would

indicate a significant difference in the magnitude of a variable's direct effect between men and women. The results yielded no significant cross-product terms, indicating general equivalence between men and women in the direct effects of all independent variables. A similar analysis conducted adding the cross-products of ethnicity and each independent variable yielded the same non-significant results. This suggests equivalence between whites and non-whites in the magnitudes of the direct effects of all independent variables on becoming a physician.

Table 2 presents the means, standard deviations, and intercorrelations among all variables in the causal model. All subsequent analyses are based on these statistics.

Insert Table 2 about here

Table 3 presents the standardized and metric coefficients for all structural equations. As shown in equation 15, the 14 variable model explained 20% of the variance in becoming a physician. While this is a modest percentage of explained variance it should be remembered that the sample was restricted to those who aspired to be physicians at entrance to college. Not only does this function to attenuate variability in the sample, but it also removes initial occupational aspiration as a potential explanatory variable in the analysis.

As further shown in equation 15, net of other influences only one of the seven student precollege variables, secondary school

social accomplishment, had a significant, direct effect on becoming a physician; and that effect was negative (-.10). Of the four remaining significant direct effects on becoming a physician, two represented variations in the student's experience of college. Statistically controlling the influence of all other predictors, institutional selectivity/prestige had a significant positive direct influence on becoming a physician (.20), while attending an institution with a high percentage of physical/life science majors negatively affected one's likelihood of becoming a physician (-.13). The significant influence of both college experience variables on becoming a physician was positive: majoring in the physical/life sciences (.24) and collegiate academic achievement (.22).

Insert Table 3 about here

Table 4 presents the standardized indirect effects of each variable on becoming a physician, their statistical significance, and the mediating variables through which the major part of the indirect effect is transmitted. As Table 4 shows, two of the precollege variables had significant indirect effects on becoming a physician, even though their direct effects were non-significant. Net of other causes, being a woman did not directly disadvantage one's chances of becoming a physician; it did, however, have a significant negative indirect influence. This was due largely to the fact that, net of other factors, women were somewhat less likely

to attend a selective/prestigious undergraduate institution, to major in the physical/life sciences, or to have sufficiently high levels of collegiate academic achievement. Each of these latter three variables, of course, had sizeable positive direct effects on becoming a physician.

Insert Table 4 about here

Net of other causes, secondary school academic performance did not directly influence one's chances of becoming a physician. It did, however, substantially improve one's likelihood of attending a selective/prestigious undergraduate college, of being a physical/life sciences major, and of performing well academically in college. The indirect effect of secondary school academic achievement, mediated largely through these three variables, was substantial (.20). Thus, while not directly affecting one's probability of becoming a physician, high academic performance in secondary school did facilitate a series of institutional, field of study, and performance advantages during college. These, in turn, significantly increased the probability of realizing one's precollege occupational aspirations.

Two of the three institutional characteristics assessed in the study had significant indirect effects on becoming a physician: institutional selectivity/prestige and the percent students in the institution majoring in science. Both of these variables also had

significant direct effects. Interestingly, however, the signs of the direct effects were the reverse of the indirect effects. Other causes held constant, attending a selective/prestigious undergraduate institution directly increased the likelihood of becoming a physician. At the same time, however, attending such an institution decreased one's chances of exceptional academic performance and of majoring in the physical or life sciences. This, in turn, produced most of the negative indirect effect of attending a selective/prestigious undergraduate college on becoming a physician.

Although attending an undergraduate college with a high percentage of physical or life sciences majors directly decreased one's likelihood of becoming a physician, it nevertheless produced a positive indirect influence. Net of other causes, an institution with a high percentage of science majors increased one's chances of majoring in physical or life sciences. This, in turn, not only positively influenced the likelihood of becoming a physician, but also enhanced collegiate academic achievement.

Finally, net of other causes, majoring in the physical or life sciences enhanced the individual's likelihood of attaining initial occupational aspirations both directly and indirectly. The positive indirect effect was transmitted through collegiate academic performance.

CONCLUSIONS AND DISCUSSION

This study employed a national sample of college students who initially aspired to be physicians in an effort to determine the influence of precollege characteristics, college origins, and the academic and social experience of college on the likelihood of actually becoming a physician. A longitudinal causal model, guided by the status attainment and college impact literature and incorporating these variable sets, was estimated. The investigation, however, represents a departure from existing research in at least two ways. First, instead of attempting to explain status attainment across a wide range of occupations, the model was applied to the explanation of attainment in a specific profession. Second, in contrast to the majority of status attainment research, which typically includes only one or two educational variables, the study employed multiple measures of between-college characteristics and students' within-college academic and social/leadership experiences.

The results of the model estimation suggest a number of general conclusions. First, net of student's gender, ethnicity, social origins, and secondary school attainments, the type of college attended and the student's academic experience within that college have important direct and, to a somewhat lesser extent, indirect effects on an individual's probability of becoming a physician. Indeed, the contextual and achievement dimensions of the collegiate

experience were clearly the most important influences on attainment in the model. In contrast, student precollege characteristics had only one significant and relatively modest, direct effect on becoming a physician. The major part of their influence was indirect, being mediated through college characteristics and the student's individual college experiences. Finally, there was little evidence in the analyses to suggest that the magnitude of variable direct effects on attainment differed in other than trivial ways by gender or ethnicity.

The remainder of the discussion is structured according to major sets of predictor variables in the model. Direct and indirect effects are discussed together.

Pre-college Characteristics

The seven precollege characteristics in the model could be generally divided into three groups: ascribed characteristics (gender, ethnicity); social origins (parent's socioeconomic status, mother or father a physician); and secondary school attainments (secondary school academic and social accomplishments). Of these categories the social origin variables appeared to play the least important role in terms of impact on becoming a physician. None of the three SES measures had either a significant direct or indirect effect on attainment. This is inconsistent with recent evidence on status attainment in professional occupations as reported by Tinto (1980, 1981) and Smart (in press). However, such an inconsistency

may be in large measure due to the more selective sample used in the present study (i.e., those who aspired to be physicians at entrance to college). Eliminating initial occupational aspirations as an intervening variable also would eliminate the indirect influence of social origin on becoming a physician through its effects on aspiration.

The most important impact of social origin in the analyses appeared to be on the characteristics of the undergraduate institution attended. Net of all other precollege variables, family socioeconomic status positively and directly enhanced the individual's likelihood of attending a small private college or a particularly selective/prestigious institution. The latter finding is quite consistent with previous research on the effects of social origin on the quality of the undergraduate institution attended (e.g., Hearn, 1984; Karabel and Astin, 1972). Clearly secondary school academic achievement had, by far, the strongest direct effect on institutional selectivity/prestige (.37). Even with academic achievement (as well as other precollege variables) taken into account, however, family socioeconomic status still had a substantial (.19) direct influence institutional selectivity/prestige. Thus, regardless of academic performance in secondary school an individual's social origins may provide an independent advantage or disadvantage in terms of the quality of the undergraduate institution attended. In the present analyses, however, this advantage (or disadvantage) was of insufficient magnitude to yield a

statistically significant indirect impact on becoming a physician.

Two other background variables, however, did have significant indirect effects on attainment. Net of other factors, women were not directly disadvantaged in terms of realizing initial aspirations to become a physician. Nevertheless, being a woman did lead to a number of disadvantages at critical points in the attainment process (e.g., the quality of the undergraduate institution attended, majoring in the physical or life sciences). The cumulative effect of these disadvantages was the significant, negative indirect influence of being female on becoming a physician.

A similar pattern held for secondary school academic performance. Net of other causes, one's secondary school achievement had only a trivial, direct effect on his or her chances of becoming a physician. Nevertheless, exceptionally high academic performance in secondary school conferred upon the individual a set of distinct advantages in areas which clearly enhanced the ultimate likelihood of attaining initial aspirations. These included an increased probability of attending an "elite" undergraduate college, higher levels of collegiate academic achievement and perhaps the confidence to major in intellectually demanding fields that are closely related to the medical profession (i.e., the physical and life sciences).

College Characteristics and the Collegiate Experience

The findings of the present study are quite supportive of Tinto's (1980) hypothesis that college origins and academic accomplishment during college play a particularly central role in occupational attainment in the professions. At the same time, the nature of the impact of the college origin variables on becoming a physician was complex, their indirect effects being the reverse of their direct effects. Net of the other factors, for example, the quality (i.e., selectivity/prestige) of the individual's undergraduate institution directly enhanced his or her chances of becoming a physician. Conversely, the indirect effect of college selectivity/prestige on attainment was negative. Quite likely the latter finding is attributable to the highly competitive nature of elite colleges and universities. Not only is a high level of academic achievement increasingly difficult to attain, but it is also likely that the most intellectually demanding majors (e.g., the physical/life sciences) are competitive enough to discourage selection by all but the most academically competent and committed.

- This "relative deprivation" or "frog-pond" effect (Davis, 1965; Drew and Astin, 1972; Reitz, 1975) suggests that the attainment advantages which accrue to an individual attending a selective or prestigious undergraduate institution need to be balanced against the fact that academic rewards in those competitive environments are relatively more difficult to come by. If one is capable of obtaining those rewards, however, they may have relatively greater

instrumental value because of the highly selective and competitive arena in which they were won. Thus, if confronted with two applications displaying roughly the same levels of acceptable academic performance, medical school admissions committees are perhaps more likely to give greater weight to that record attained at what they judge to be the more competitive college.

To further test this hypothesis we conducted an additional analysis which regressed becoming a physician on all variables in the model, plus a cross-product of institutional selectivity/prestige X collegiate academic achievement. Net of other variables, this cross product had a regression coefficient significant at $p < .05$ ($t = 2.03$). The equation for the variables involved (controlling all other effects) was $-.071$ (institutional selectivity/prestige) $-.057$ (collegiate academic achievement) $+.005$ (institutional selectivity/prestige X collegiate academic achievement). Using a method described by Cohen and Cohen (1975), it was determined that institutional selectivity/prestige had its strongest positive influence on becoming a physician for students with the relatively highest levels of college academic achievement. As level of achievement decreased, however, the relative advantage gained in attending an elite institution also declined.

This suggests that the substantive advantage gained by students attending an elite institution is activated only when such attendance is accompanied by a strong record of academic achievement. In this sense, the findings clearly support Tinto's (1980) hypothesis that the effect of college quality on attainment

may be latent rather than active. Simply attending an elite institution may, in itself, be no real guarantee of a discernible advantage in realizing career aspirations. Individuals must demonstrate academic competence, preferably as a science major, sufficient to make them competitive with other applicants to medical school. Once this relatively high level of competence is demonstrated, however, being at an elite institution provides the individual with an additional advantage in terms of becoming a physician.

Attending an institution with a high percentage of physical or life science majors also had a conflicting pattern of influences on becoming a physician. Controlling for other causes, enrolling at an institution with a relatively large percent of the student body majoring in science had a negative, direct effect. Because it increased the likelihood of any one individual majoring in the physical or life sciences, however, its indirect impact was positive. Perhaps the more difficult of these two findings to explain is the negative direct effect. One possible, though tentative, explanation is that institutions with large undergraduate science programs tend to be highly selective and competitive. (This is suggested by the fact that percent science majors in an institution correlates .32 with the institutional selectivity/prestige variable. Also, the only significant predictor of whether one attended an institution with a relatively large science emphasis was secondary school academic achievement). The

highly competitive nature of such programs may lead the less academically competent to either change major and/or lower one's career aspirations.

Limitations

College origins and academic accomplishments within college appear to play crucial roles in attainment of initial aspirations to become a physician. To this extent, the findings of the present study tend to support Tinto's (1980, 1981) hypothesis that college quality and academic success are more important in the explanation of status attainment in professional than in non-professional occupations. Because the study focuses on occupational attainment in a specific profession, however, and because this profession requires graduate training, it is likely that results in large measure reflect the ability of the model to explain successful, or (unsuccessful) medical school admission. Thus, attendance at an elite undergraduate institution, majoring in a physical/life science, and high levels of collegiate academic achievement may increase the likelihood of becoming a physician, largely because they increase the likelihood of competing successfully for admission to medical school. However, once admitted to medical school approximately only three percent withdraw. Almost ninety-seven percent attain the M.D. (Jones & Vanyur, 1984).

This may only be part of the explanation, however. For some students variables in the model, such as collegiate academic achievement and whether or not they majored in a science, may

reflect the maintenance, changing, or lowering of initial career aspirations. Some individuals initially aspiring to be physicians, for example, may lower their aspirations and even change their major, if they find they cannot compete in terms of the minimal academic performance required for admission to medical school. Unfortunately, with only one follow-up, the configuration of the CIRP data makes it nearly impossible to separate the effects of aspiration changes during college from failure to get into medical school.⁵

The study has other limitations. The data follow students only over a nine-year period from first enrollment as college freshmen. Consequently, while we can determine who realizes initial aspirations to become a physician, we cannot determine the effects of college, if any, on subsequent success within the profession. Similarly, the occupational categories provided by the data do not permit the possible explanation of differential statuses (i.e., specialties) within medicine. These are potentially important areas for future research.

Footnotes

1. Since the study focuses only on the subsequent occupational attainment of students who aspired to become physicians at entrance to college, precollege occupational aspirations are held constant.
2. A very small number of individuals indicated that they had not obtained the M.D. degree as of 1980, but were still actively pursuing it. These individuals were dropped from the analysis.
3. Because of the possibility of selective, non-representative response on the follow-up survey, the CIRP data contain a weighting algorithm to adjust for response bias. All analyses reported in the paper are based on weighted sample estimates adjusted to actual sample size to obtain correct degrees of freedom. Parallel sets of analyses were conducted with weighted and unweighted samples. Although there were only trivial differences in the results, the weighted estimates are reported.
4. Due to the dichotomous nature of the dependent variable, the direct effects results for all equations were reestimated with a log-linear analysis. This analysis fits the logistic regression model to binary dependent measure. The results of this analysis yielded coefficients which differed only slightly in relative magnitude, and not at all in statistical significance, from the ordinary least squares regression results.
5. Of the 269 students who did not become physicians, 38 (14.1%) were in occupations related to the medical field (dentistry = 7, nursing = 5, optometry = 3, pharmacy = 4, scientific research = 19), while 27 (10%) were in occupations of approximately equal status to that of physician according to the Duncan scale (Featherman and Stevens, 1982). These included: architecture, college professor, law, and engineering. The remaining individuals were in occupations generally lower on the Duncan scale.

TABLE 1
VARIABLE DEFINITIONS

Variable	Definition
<u>Student Precollege Variables</u>	
1. Gender	Female = 1; male = 0
2. Ethnicity	Caucasian = 1; minority = 0
3. Father a Physician	Yes = 1; no = 0
4. Mother a Physician	Yes = 1; no = 0
5. Secondary School Academic Achievement ^a	Sum of secondary school grades (1 = "D", to 8 = "A or A+") and secondary school class rank (1 = "4th quarter", to 4 = "top quarter"); alpha reliability = .78
6. Secondary School Social Accomplishment	Sum of five secondary school social/leadership activities (e.g., "president of a student organization"; "participated in a play"); coded 1 = "no"; 2 = "yes"; alpha reliability = .59
7. Family Socioeconomic Status (SES)	Sum of parents' combined level of education (six categories, from "grammar school or less" to "post graduate degree") and combined parental income (twelve categories, from "less than \$4,000" to "\$40,000 or more"); alpha reliability = .61
<u>Institutional Characteristics</u>	
8. Institutional Selectivity/Prestige	A factorially derived scale which included the following institutional characteristics: (a) average academic ability of the entering class expressed as a combined SAT verbal and mathematics score, or the equivalent ACT composite score; (b) financial expenditures per student; (c) percent graduate student enrollment; alpha reliability = .68
9. Institutional Size ^a	A factorially derived scale which included the following three institutional characteristics: (a) student/faculty ratio; (b) total enrollment; and (c) public control alpha reliability = .71

Table 1 (continued)

Variable	Definition
10. Percent Students in the Institution Majoring in Physical/Life Sciences	Average percent students in the institution majoring in physical sciences (e.g., physics, chemistry) or life sciences (e.g., biology, biochemistry, zoology)
<u>College Experience Variables</u>	
11. Physical/Life Sciences Major	Physical or life sciences major = 1; non-physical/life sciences major = 0
12. Collegiate Academic Achievement	The sum of two items: (a) average undergraduate grades (coded: 1 = "D or less" to 6 = "A- or more"); and (b) membership in scholastic honor society (coded: 1 = no; 2 = yes); alpha reliability = .60
13. Interaction with Faculty/Staff	A single item: "knew a professor or administrator personally"; coded 1 = "no"; 2 = "yes"
14. Social Leadership Experiences	Sum of four items assessing the student's social/leadership involvement with peers ("president of one or more student organizations"; "served on a university or departmental committee"; "edited a school publication"; "had a major part in a play") alpha reliability = .46
<u>Dependent Variable</u>	
15. Became a Physician	Became a Physician (M.D. degree) in 1980 = 1; did not become a physician = 0

^a Because the items constituting these scales were on a different metric, they were standardized prior to summation. A constant was added to eliminate negative scores.

TABLE 2
MEANS, STANDARD DEVIATIONS AND INTERCORRELATIONS FOR ALL VARIABLES^a

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender (1 = female; 0 = male)	.33	.47		-.19	-.06	.08	.11	-.13	-.06	-.02	-.01	.05	-.06	-.05	-.04	.05	-.06
2. Ethnicity (1 = caucasian; 0 = minority)	.76	.42		.2	.03	.24	.09	.26	-.00	-.10	.13	.16	.26	.11	-.11	.04	
3. Father a Physician	.09	.28			.16	.04	.09	.34	.04	-.05	.05	-.01	.04	-.00	.04	.08	
4. Mother a Physician	.01	.05				.05	.04	.01	-.03	-.04	-.01	.05	.09	.03	.02	.11	
5. Secondary School Academic Achievement	21.10	1.49					.20	.09	.34	-.14	.18	.21	.43	.09	.12	.23	
6. Secondary School Social Achievement	6.22	1.08						.09	.09	-.11	.03	-.02	.12	.11	.20	-.04	
7. Family Socioeconomic Status	21.22	1.90							.18	-.16	.09	-.01	.07	.06	.02	.03	
8. Institution Selectivity/Prestige	22.66	3.26								.06	.32	.02	-.05	-.01	-.08	.16	
9. Institutional Size	8.92	2.22									-.27	.16	-.08	-.13	-.18	-.05	
10. Percent Students in the Institution Majoring in Physical/Life Sciences	16.93	8.50										.19	.08	.05	.00	.02	
11. Physical/Life Science Major	.54	.50											.26	-.01	-.01	.29	
12. Collegiate Academic Achievement	20.50	1.77												.08	.13	.27	
13. Interaction with Faculty/Staff	1.80	.40													.15	.05	
14. Social Leadership Experiences	4.63	.85														.01	
15. Became a Physician	.20	.40															

^a Decimals omitted from correlations.

TABLE 3
STRUCTURAL EQUATIONS^a

Variable	8	9	10	11	12	13	14	15
1. Gender (1 = female; 0 = male)	-.078 (-.541)	-.018 (-.085)	.056 (10.061)	-.096 (-.101)	-.073 (-.273)	-.030 (-.029)	.016 (.030)	-.055 (-.047)
2. Ethnicity (1 = Caucasian; 0 = minority)	-.148** (-1.184)	-.034 (-.182)	.087 (17.827)	.088 (.107)	.100 (.425)	.074 (.071)	-.178** (-.365)	-.078 (-.075)
3. Father a Physician	-.015 (-.179)	.018 (.142)	.027 (8.137)	-.031 (-.056)	-.010 (-.062)	-.043 (-.062)	.024 (.072)	.080 (.114)
4. Mother a Physician	-.041 (-2.468)	-.031 (-1.283)	-.028 (-43.550)	.049 (.451)	.052 (1.688)	.026 (.195)	-.001 (-.017)	.074 (.546)
5. Secondary School Academic Achievement	.370** (.808)	-.105 (-.157)	.163** (8.701)	.207** (.068)	.449** (.534)	.061 (.016)	.182** (.083)	.073 (.020)
6. Secondary School Social Accomplishment	.009 (.027)	-.071 (-.147)	-.006 (-.463)	-.086 (-.040)	.041 (.068)	.075 (.028)	.176** (.139)	-.104* (-.039)
7. Family Socioeconomic Status	.190** (.327)	-.140* (-.164)	.053 (2.355)	-.046 (-.012)	.053 (.050)	.029 (.006)	.035 (.016)	-.024 (-.005)
8. Institutional Selectivity/Prestige				-.82 (-.013)	-.241** (-.131)	-.035 (-.004)	-.151** (-.040)	.201** (.025)
9. Institutional Size					-.087 (-.020)	.057 (.045)	-.104 (-.019)	-.148** (-.057)
10. Percent Students in the Institution Majoring in Physical/Life Sciences					.159** (.001)	.046 (.001)	.019 (.000)	-.001 (-.000)
11. Physical/Life Sciences Major						.138** (.481)	-.053 (-.043)	-.029 (-.050)
12. Collegiate Academic Achievement								.222** (.050)

Table 3 (continued)

Variable	8	9	10	11	12	13	14	15
13. Interaction with Faculty/Staff							.049 (.049)	
14. Social Leadership Experiences								-.020 (-.001)
15. Became a Physician								
R ²	.165	.049	.048	.111	.280	.040	.116	.200

^a Top number is the standardized coefficient; number in parentheses is the unstandardized or metric coefficient

* p < .05
** p < .01

TABLE 4
STANDARDIZED INDIRECT EFFECTS AND MAJOR
MEDIATING VARIABLES^a

VARIABLE	INDIRECT EFFECT	t ^b	MEDIATING VARIABLES
1. Gender (1 = female; 0 = male)	-.056	2.52*	Institutional Selectivity/Prestige; Physical/Life Sciences Major; Collegiate Academic Achievement
2. Ethnicity (1 = caucasian; 0 = minority)	.030	1.09	
3. Father a Physician	-.018	.84	
4. Mother a Physician	.024	1.19	
5. Secondary School Academic Achievement	.196	4.67**	Institutional Selectivity/Prestige; Physical/Life Sciences Major; Collegiate Academic Achievement
6. Secondary School Social Accomplishment	-.008	.34	
7. Family Socioeconomic Status	.029	1.11	
8. Institutional Selectivity/Prestige	-.074	2.81**	Physical/Life Sciences Major; Collegiate Academic Achievement
9. Institutional Size	-.012	.56	
10. Percent Students in the Institution Majoring in Physical/Life Sciences	.053	2.45*	Physical/Life Sciences Major; Collegiate Academic Achievement
11. Physical/Life Sciences Major	.029	1.98*	Collegiate Academic Achievement

^aBased on the model Collegiate Academic Integration.
Interaction with Faculty/Staff and Social Leadership Experiences have
direct effects only on becoming a physician.

^bN = 337

*p < .05

**p < .01

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